U.S. Department of Agriculture
Forest Service
Resource Bulletin SO-77

Arkansas Forests

Trends and Prospects

Willem W. S. van Hees

Southern Forest Experiment Station

ACKNOWLEDGEMENTS

Field assistance from public and private organizations greatly facilitated this forest inventory of Arkansas. The very material aid of the organizations listed below, and of the individuals in them, is gratefully acknowledged:

Arkansas Forestry Commission

Chicago Mill and Lumber Company, Inc.

Deltic Farm and Timber Company, Inc.

Georgia Pacific Corporation

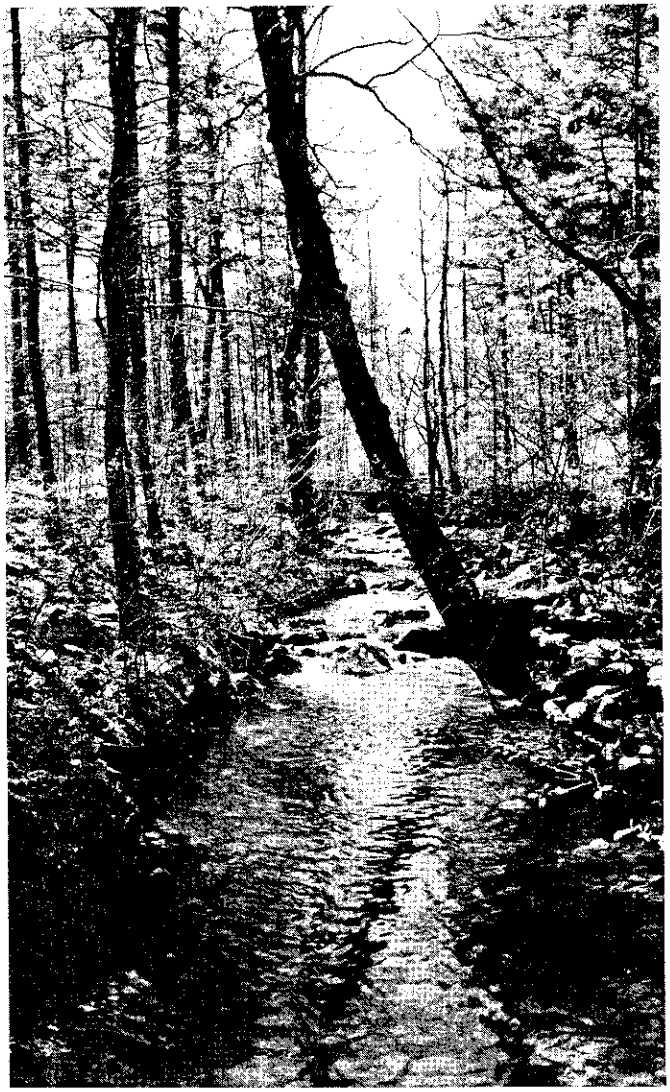
International Paper Company

Nekoosa-Edwards Paper Company, Inc.

Potlach Forests, Inc.

Arkansas Forests

Trends and Prospects



Willem W. S. van Hees

U.S. Department of Agriculture
Forest Service
Resource Bulletin SO-77

CONTENTS

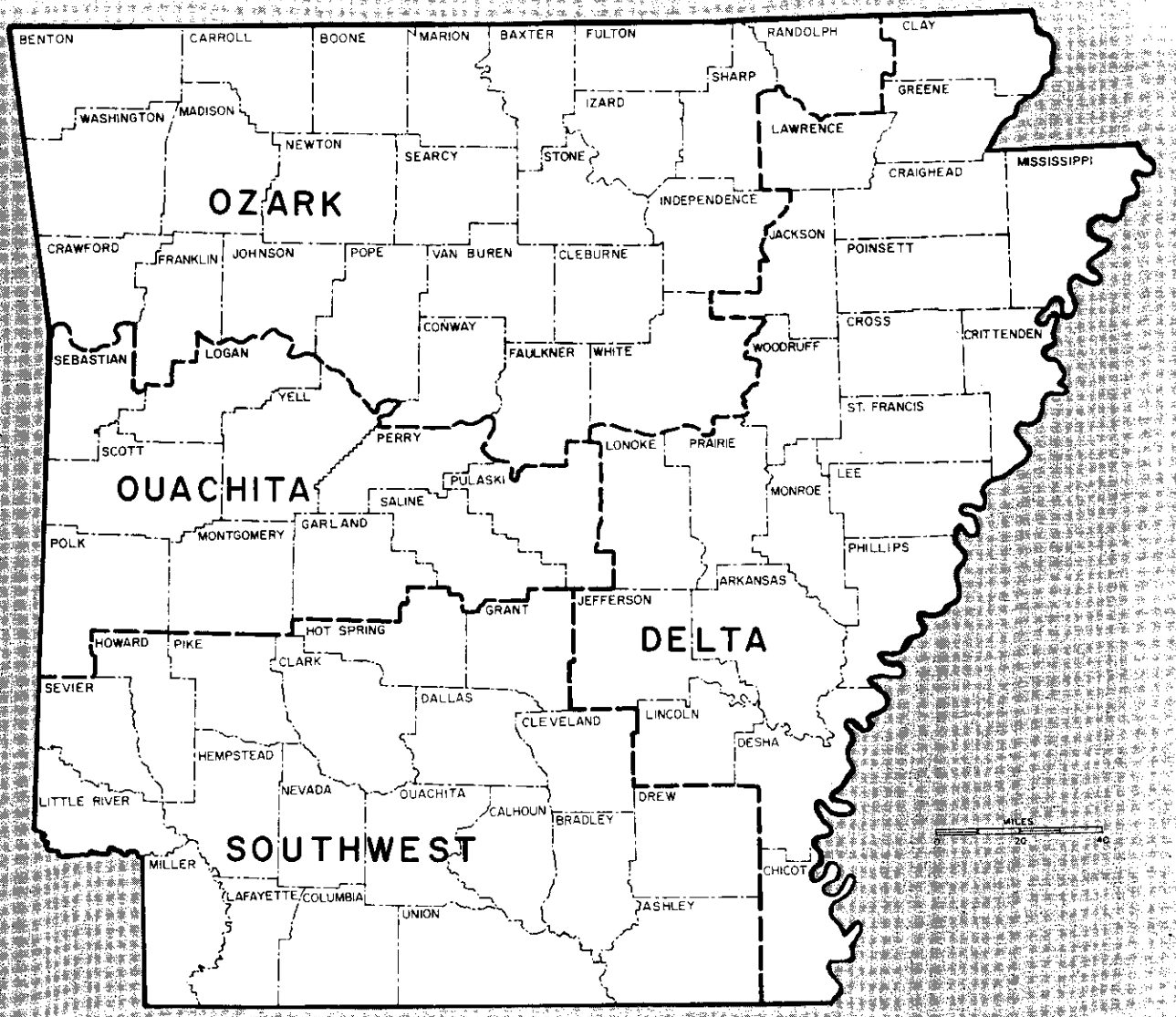


Figure 1.—*Forest Survey regions in Arkansas.*

Arkansas Forests: Trends and Prospects

Willem W. S. van Hees

RESOURCE HIGHLIGHTS

The 1978 Arkansas Forest Survey shows a 9 percent reduction in forest land area since 1969. Presently 16.6 million acres, 50 percent of the total State area, are forested. Diversions of forest land to agriculture, particularly to soybean fields in the Delta and to pasture in the Ozarks, account for most of the decline.

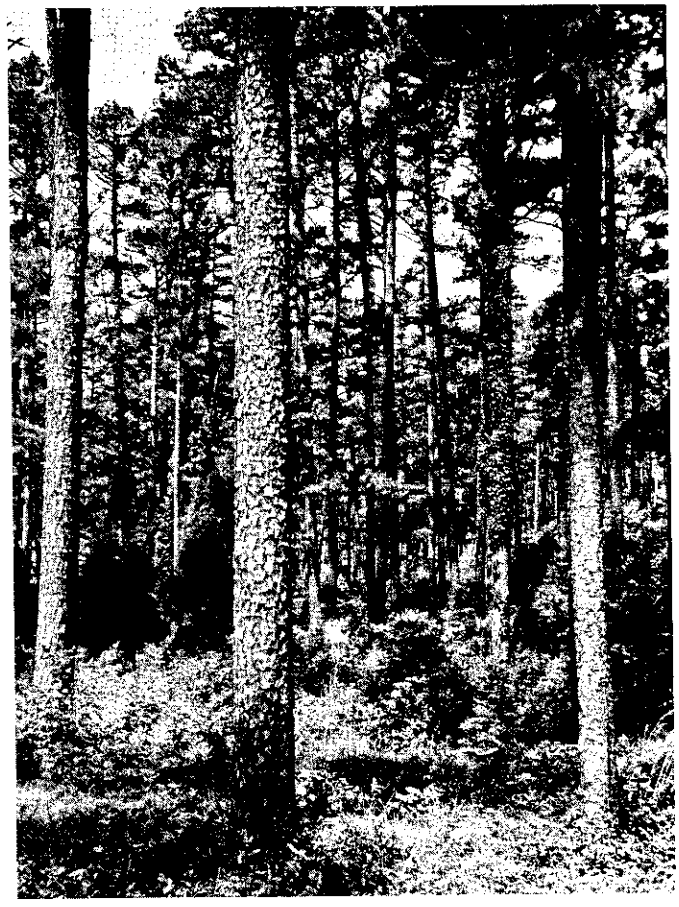
Although forest land area continued to decline, total growing stock volume inceased almost 5 percent to 17.2 billion cubic feet. Softwood growing stock volume increased 13 percent between 1969 and 1978 versus 16 percent between 1959 and 1969. This decrease in volume increment is due mainly to the loss of about 1 million acres of pine site forest land. Between 1959 and 1969 hardwood growing stock volume decreased almost 7 percent. In the past decade this volume decreased an additional 2 percent to the present 9.1 billion cubic feet.

In 1977, statewide net growth on growing stock exceeded removals from growing stock for softwoods and hardwoods. In all four survey regions (fig. 1), hardwood growth exceeded removals. However, softwood growth exceeds removals only in the Ozark and Southwest regions. Total removals of growing stock, including non-industrial removals, amounted to 404.5 million cubic feet for softwoods and 210.3 million for hardwoods.

Since 1969 stocking has improved somewhat. Overall, stocking now averages 1040 cubic feet per acre versus 906 cubic feet in 1969.

Over the past decade, production and consumption of Arkansas' timber resource have increased. Intensified management on presently productive forest land and reversion or conversion of additional acreage into productive forest will be required to maintain this trend. Opportunities exist to improve productivity on 6.4 million acres of pine site lands that support hardwood or mixed pine-hardwood stands. Additionally, 5.9 million acres of hardwood stands need substantial amounts of attention; almost 40 percent of all live hardwood trees are classed rough and rotten.

Work on this survey began in October 1977 with the last sample plot being measured in March 1979. In the following analysis 1978 is the date of the resource information except that growth, cut, and industrial output estimates are for 1977.



Softwood volume up—softwood inventory increased in all parts of the State. Nearly three-fourths of the State's 13 percent increase since 1969 was in the Southwest Region.

Willem W. S. van Hees is Research Forester, formally with the Southern Forest Experiment Station Forest Service—USDA, New Orleans, Louisiana; currently with the Pacific Northwest Forest and Range Experiment Station, Forest Service—USDA, Anchorage, Alaska.

FOREST AREA

Forest Land Area Declines

Since 1959 forest area in Arkansas has decined steadily. Presently 16.6 million acres, 50 percent of the total State area, are forested. This is 9 percent less than was reported in the 1969 survey (Van Sickle 1969).

Forest area losses are recorded for all four survey regions (table I, fig. 2). Clearing forested land for agricultural purposes has claimed about 1.1 million acres since 1969. The largest percentage losses to agriculture occurred in the Delta and Ozark regions—27 and 49 percent respectively. In the Delta, bottomland hardwood sites were cleared primarily for soybean fields. Upland hardwoods in the Ozark region were replaced with pasture.

Urbanization claims the second largest share of forest acres. Since 1969, urbanization, predominantly in the Ozark and Southwest regions, claimed 214,000 acres.

Reversions of non-forest and non-commercial forest land to commercial forest land amounted to 496,000 acres, but this addition was insufficient to counter the losses to land clearing (table I).

Change in Ownership Pattern

Although absolute amounts of commercial forest land held by different ownership groups have changed since 1969, the relative pattern of ownership has changed little. Private ownerships encompass 13.7 million acres. The remaining 2.9 million acres are publicly owned and are mainly within the National Forest system.

As in 1969, miscellaneous private owners hold the largest portion, 47 percent, of all privately owned commercial forest acres. Forest industry and farm owners follow with 31 and 22 percent respectively.

In contrast to 1969, forest industry holdings are now larger than farm holdings by 1.3 million acres. In 1969, farmers owned 850,000 acres more than did forest industry.

Physiographic Site

Physiographic site classes indicate the suitability of a site for growing certain forest types, not necessarily the forest type currently growing on the site. The methods for determining forest types have changed since 1969 and make temporal comparisons of forest type acreage invalid. However, physiographic site class acreages are comparable.

Of Arkansas' commercial forest acreage, 10.6 million acres are suitable for growing pine (fig. 3). In 1969, 11.6 million acreas were classed as pine sites. This decline is mainly a result of commercial forest acreage diversions to other uses, not a result of actual site changes.

Forest area down—more than two million acres of commercial forest land have been diverted to nonforest use since 1969. Over half of the divisions occurred in the Ozark Region.

Table I.—*Change in commercial forest land, 1969 to 1978*

Resource region	Net change	Additions from:			Diversions to:		
		Total	Nonforest	Noncommercial forest	Total	Agriculture	Other
	Thousand acres						
Delta	− 149.4	195.4	195.3	.1	344.8	285.5	59.3
Southwest	− 256.8	60.5	60.5	. . .	317.3	169.7	147.6
Ouachita	− 122.0	85.8	83.5	2.3	207.8	85.7	122.1
Ozark	− 1,062.9	153.8	153.8	. . .	1,216.7	509.4	707.3
All regions	− 1,591.1	495.5	493.1	2.4	2,086.6	1,050.3	1,036.3

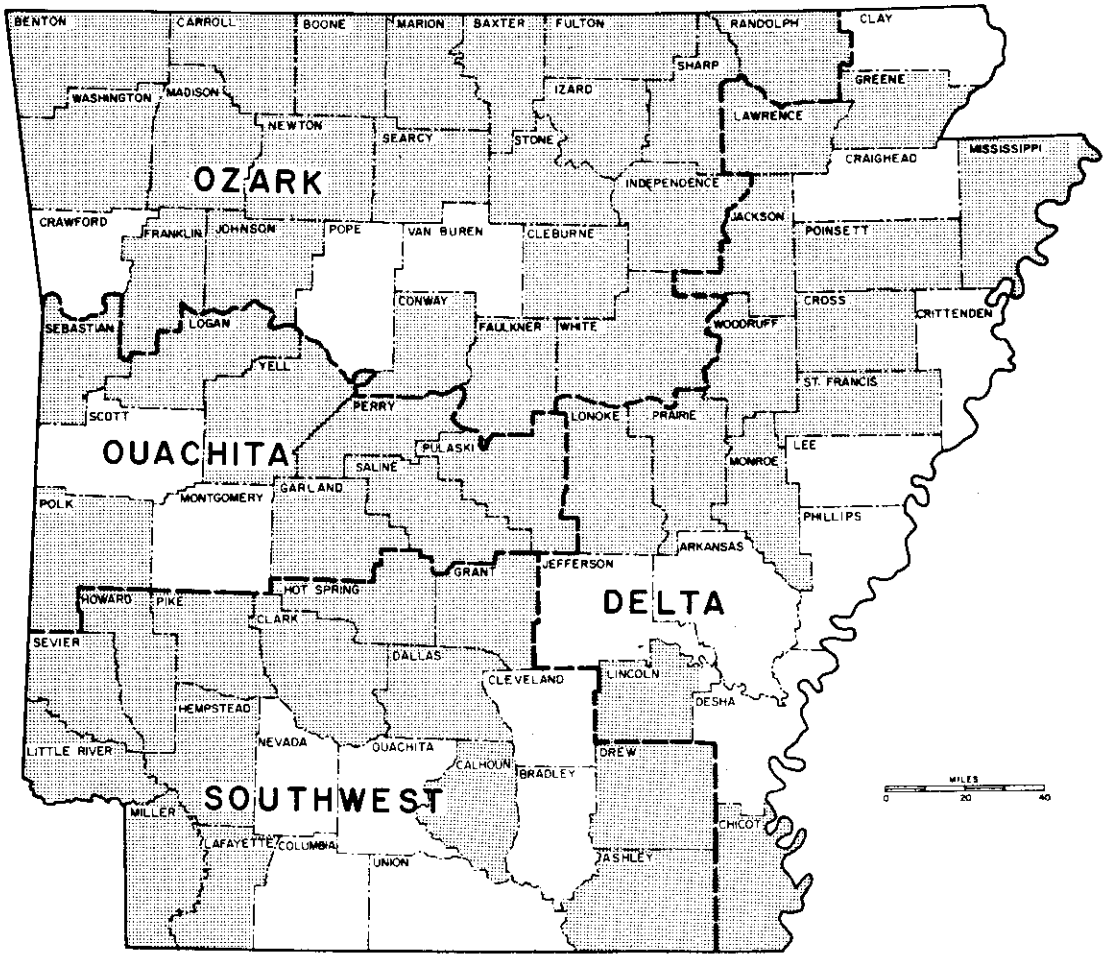


Figure 2.—*Arkansas counties with a loss in commercial forest acreage between 1969 and 1978.*

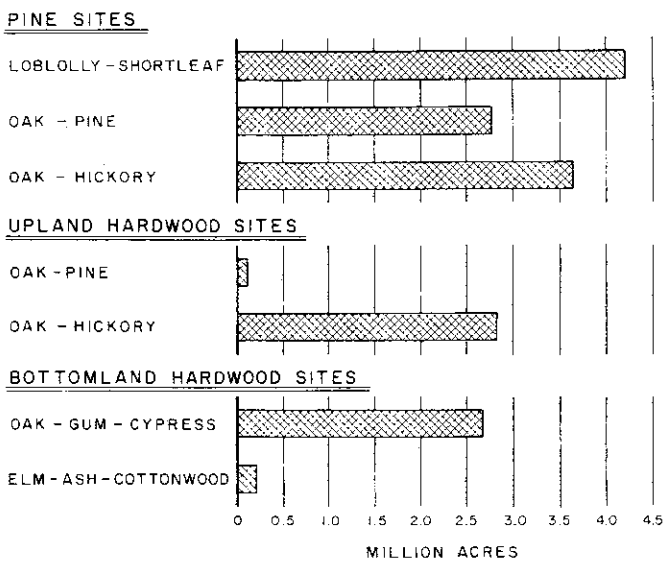


Figure 3.—*Area of commercial forest land by forest type and physiographic site.*

Almost 50 percent of the available pine sites[1] are in Southwest Arkansas. However, as is true of much of the State, excluding the Delta region, approximately half of these sites are occupied by oak-pine and oak-hickory forest types. The presence of hardwood types on pine sites may indicate that site productivity is not optimal. Statewide, oak-pine and oak-hickory types cover about 3 million and 7 million acres respectively while the loblolly-shortleaf types cover roughly 4 million acres.

Upland and bottomland hardwood sites each encompass 3 million acres, a 500,000-acre decline in upland hardwood acreage and a 180,000-acre decline in bottomland hardwood acreage.

[1]"Pine site" refers to a physiographic classification which indicates the suitability of a site for growing pine types, not necessarily the forest type currently growing on the site.

TIMBER VOLUME

Arkansas forests currently contain 17.2 billion cubic feet of growing stock volume, an increase of almost 5 percent since 1969. Due to changes made in volume computation procedures, all 1969 volumes have been recomputed since the last survey in order to maintain data comparability.

Softwood Volume Increases

Between 1969 and 1978 Arkansas' softwood growing stock resource increased to roughly 8.2 billion cubic feet (table II). Ninety-six percent of this volume is in loblolly and shortleaf pines (fig. 4). Redcedar and cypress account for the remainder.

Softwood volume is increasing but at a somewhat slower rate than a decade ago. Between 1959 and 1969, softwood growing stock volume increased 16 percent. This rate slowed to 13 percent between 1969 and 1978. Much of this decrease in volume increment is due to the loss of about one million acres of pine site forest land.

Forest industry manages the largest portion of the softwood sawtimber resource. Currently 14.4 billion board feet stand on forest industry land. National Forests, mainly in the Ozark and Ouachita regions, support roughly 6.2 billion board feet. These owner classes possess 60 percent of the softwood sawtimber volume in Arkansas.

Reflecting an interest in optimizing softwood production, forest industry softwood sawtimber stocking averages 3.4 thousand board feet per acre and National Forest holdings average 2.6 thousand board feet per acre. All other owners average less than 1.5 thousand board feet of sawtimber stocking. These figures point out that National Forests in Arkansas have a slightly higher relative mixed pine-hardwood and hardwood forest type component than does forest industry.

Table II.—*Growing stock volume in 1978 and change since 1969*

Resource region	Softwood		Hardwood	
	Volume	Change[1]	Volume	Change[1]
	Million cubic feet	*Percent*	*Million cubic feet*	*Percent*
Delta	238.0	+15	1,775.5	− 2
Southwest	4,914.0	+16	3,433.8	− 1
Ouachita	2,313.4	+ 4	1,090.7	+10
Ozark	702.6	+20	2,779.9	− 6
All regions	8,168.0	+13	9,079.9	− 2

[1]Based on current measurement standards.

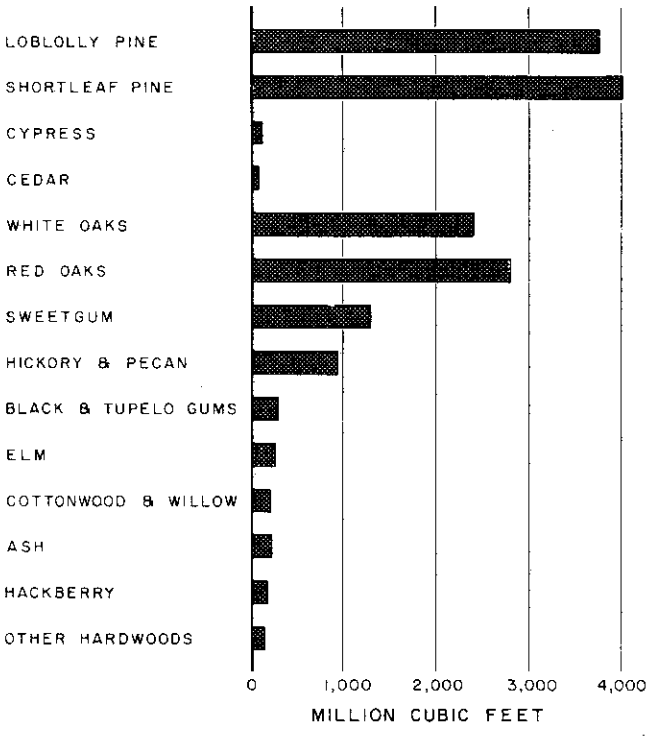


Figure 4.—*Growing-stock volume by species, Arkansas, 1978.*

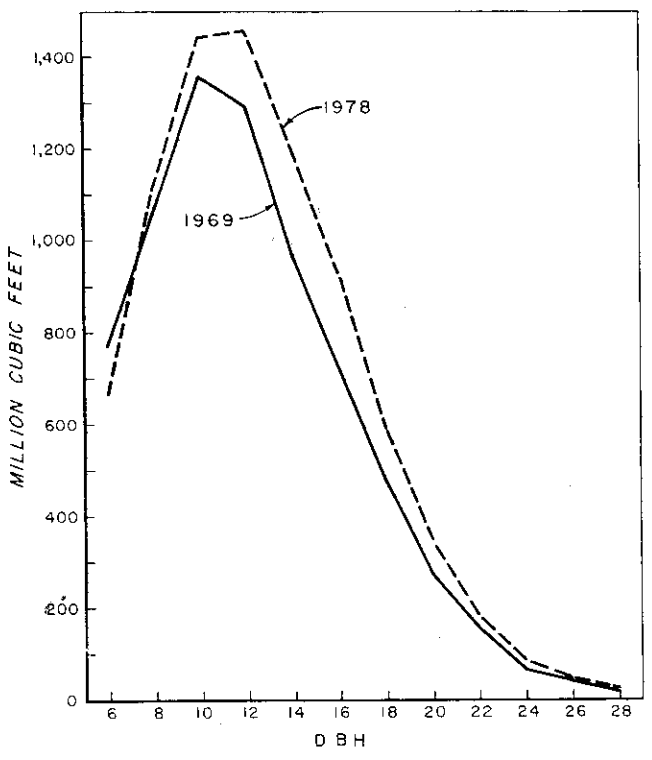


Figure 5.—*Softwood growing-stock volume by tree diameter, Arkansas, 1969 and 1978.*

Softwood growing stock volume increases are not uniform across all diameter classes (fig. 5). Decreases in the two- and four- inch classes are not shown because they include no merchantable volume. These changes reflect the maturation of softwood stands in existence since the late 1950's and early 1960's. Since that decade, annual forest planting efforts have only recently reached, and sometimes exceeded, the 1959 level of roughly 81.0 thousand acres. This level was surpassed in 1975 but by 1979 softwood planting had dropped below this figure (USDA 1959, 1975, 1979). In the 9 years between 1960 and 1969 a maximum of about 32.0 thousand acres were planted annually. This decade of sharp decline in planting activity accounts for much of the decrease in the two- and four- inch diameter classes. An additional influence here is a decline in the amount of agricultural land that reverted to forested acres.

Some 98 percent of the total live tree softwood volume is in growing stock trees. Only 2 percent of the total cubic foot volume is in rough, rotten, and salvable dead trees (fig. 6). Seventy-eight percent of the total growing stock volume, 8.2 billion cubic feet, is in sawtimber trees. Ninety-two percent of this volume in turn is located in the sawlog portion of these trees.

Hardwood Volume Decreases

Between 1959 and 1969 hardwood growing stock volume decreased almost 7 percent. In the past decade this volume decreased an additional 2 percent to the present 9.1 billion cubic feet. Another two billion cubic feet are in rough, rotten, and salvable dead trees (fig. 6).

Although all four survey regions suffered substantial commercial forest acreage declines, only the Ozark region—with the largest decline—also experienced a decline in hardwood volume (table III).

Although volume changes are slight, Arkansas' hardwood resource has suffered since 1969. Except for the eight-inch diameter class, volume losses are evident in all diameter classes from 6 to 14 inches (fig. 7). Additional losses occurred in the two- and four- inch trees, although they carry no volume. Furthermore, the increases that took place in the larger diameter classes are modest at best. Custodial management, frequently practiced on hardwood stands, is responsible for much of these changes. Hardwood and mixed pine-hardwood stands are often left alone until either the hardwoods are of sufficint quantity and/or quality to justify removal or until extraction of the pines in mixed stands is warranted. Conversions of commercial forest acreage to other uses and efforts to control young hardwoods in pine stands add to the depletion of poletimber and small growing stock trees.

Another indication that the hardwood resource suffered more than a minor volume setback during the past decade lies in the changes that occurred in wood

quality. Among the major hardwood species (the select oaks, other oaks, hickories, and sweetgum) the percent of total sawtimber volume in grade 1, 2, and 3 logs decreased 3 percent in each grade since 1969 while the percent of total volume in grade 4 logs increased from 17 to 26 percent. This same pattern is true for hardwoods in general.

REGIONAL DIFFERENCES

The four survey units in Arkansas are based on major physiographic boundaries. For the sake of data compilation, these boundaries are adjusted to follow county lines. As figure 8 suggests, the forest resource varies considerably from one region to another.

Delta Region

Eighty-eight percent of the growing stock volume in the Delta is in hardwood trees—mostly oaks, elms, ashes, sweetgum, and cottonwood. The small softwood growing stock volume is predominantly cypress. Presently 20 percent of the Delta is classified as commercial forest land. Since 1969, 10 percent of the statewide net loss of forest land has occurred in this region. Almost all losses resulted from clearing for soybean fields.

Southwest Region

The Southwest region is the most important of the four survey regions in terms of the timber resource. It contains 38 percent of the available commercial forest acres and has 48 percent of the growing stock volume. More than half of this volume is in softwoods—almost exclusively loblolly pine. Sweetgum, other red oaks, and select white oaks form the majority of the hardwood volume.

The Southwest region suffered the second largest loss of commercial forest land. Sixteen percent of the statewide loss took place here, with most of the diversions going to pasture and urbanization.

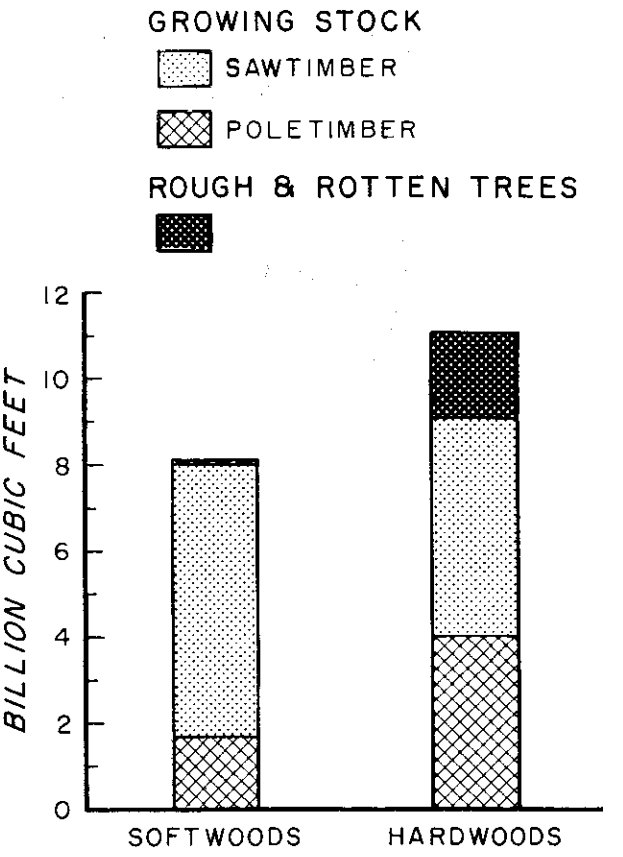


Figure 6.—*Volume of hardwoods and softwoods by class of timber, Arkansas, 1978.*

Ouachita Region

The forests of this region are characterized b abundance of shortleaf pine. Sixty-four percent o 2.2 billion cubic feet of growing stock volume is s leaf timber. Additionally, the loblolly-shortleaf forest type accounts for 37 percent of the comm forest acreage. The majority of the remaining f

Table III.—*Sawtimber volume in 1978 and change since 1969*

Resource region	Softwood		Hardwood	
	Volume	Change[1]	Volume	Change[1]
	Million board feet	*Percent*	*Million board feet*	*Percent*
Delta	1,060.7	+14	6,445.2	(2)
Southwest	21,873.8	+21	9,657.3	(2)
Ouachita	8,932.3	+13	2,145.8	+9
Ozark	2,325.8	+18	6,847.4	−5
All regions	34,198.6	+18	25,095.7	−1

[1]Based on current measurement standards.
[2]Negligible.

land is in oak-pine (27%) and oak-hickory (30%) types.

Ownership of commercial forest land in the area is dominated by the Ouachita National Forest, which encompasses 1.4 million acres. Forest industry and miscellaneous private owners are credited with 740,000 and 770,000 acres respectively.

Ozark Region

The importance of this region lies in the magnitude of the hardwood resource. Fully 27 percent of all available hardwood sawtimber volume is in this northern region. Also, more than half of this volume is in select white oaks, select red oaks, and other red oaks.

Statewide, total commercial forest acreage suffered the worst setback in the Ozark region. Slightly more than one million acres were lost to other uses, primarily pasture.

GROWTH, REMOVALS, AND MORTALITY

The Forest Survey defines the components of growth as: (1) survivor growth— the net volume increase on growing stock trees surviving from the beginning of a specified year to its end; (2) ingrowth— the net volume of trees at the time they grew into growing stock status during a specified year; (3) growth on ingrowth— the net volume increase on trees after growing into growing stock status during a specified year; (4) growth on removals— the net volume increase on growing stock trees that were cut during a specified year; and (5) mortality— the net volume of growing stock trees that died during a specified year. The sum of components (1) through (4) is gross growth. Net growth then, is gross growth minus mortality (5) (Bertelson 1971).

In 1978, as in 1969, statewide net growth on growing stock exceeded removals from growing stock for softwoods and hardwoods (fig. 9). In all four survey regions, hardwood growth exceeded removals. However, softwood growth exceeded removals only in the Southwest and Ozark regions. Removals from the Delta were only one percent higher than growth, even though land clearing amounted to 150,000 acres. Much of the timber removed in the land clearing process does not reach commercial outlets. It is often used locally or piled and burned.

Although hardwood growth exceeded removals at the time of the survey, this is unexpected in the face of declining hardwood inventories. Removals may vary widely from year to year due to changing product demands and other removals such as land clearing and cultural treatments.

In the Ouachita area, softwood removals from growing stock exceeded growth by 17 percent, because of two factors: (1) Some non-industrial private owners continue to liquidate stocking without regard for forest management practices involved, (2) efforts are undertaken by industrial owners to convert oak-pine types to pure pine, thereby creating substantial acreages of seedling sized stands on which growth is not measured.

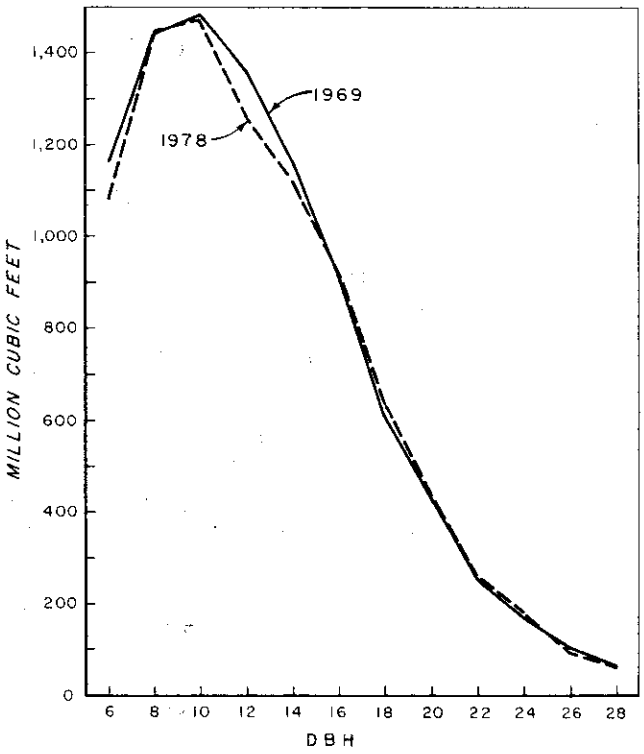


Figure 7.—*Hardwood growing-stock volume by tree diameter, Arkansas, 1969 and 1978.*

The final quantity needed in determining net growth is the volume lost to mortality. Trees usually die from a number of causes. In the Forest Survey cruisers are instructed to identify, if possible, the primary cause of death. In hardwoods, one or more of several common tree diseases caused a majority of the mortality, while insects and diseases were responsible for most of the softwood mortality.

PRODUCTIVITY

The productivity of a forest depends on a variety of interrelated factors, not all of which are readily quantifiable by methods employed in the Forest Survey. Some of the productivity indicators that are evaluated include stocking levels, site class, and area condition class. (For specific definitions see Appendix.) Due to computational changes, stocking and area condition class values are not comparable between 1969 and 1978. Site class is an expression of potential yields in cubic feet per acre of mean annual growth at culmination of mean annual increment. This definition has not changed between surveys thereby allowing direct comparison of 1969 and 1978 values.

The average commercial forest acre in Arkansas is capable of producing 78 cubic feet of gross growth annually according to the above definition of site class. Regional figures are: 52 cubic feet per acre in the Ozarks, 66 in the Ouachitas, 95 in the Delta, and almost

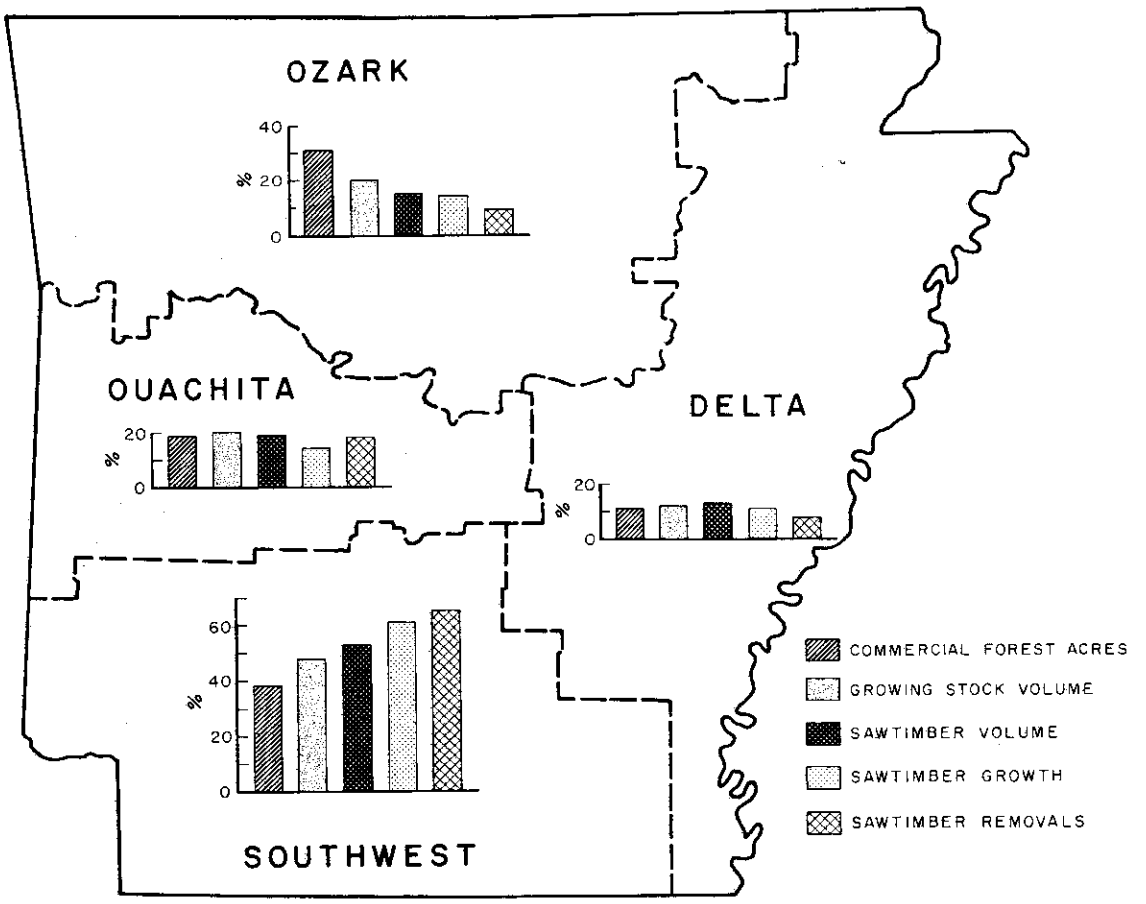


Figure 8.—*Relative importance of forest resources by region, Arkansas, 1978.*

100 in the Southwest region. The 1978 survey recorded a decrease in the percentage of commercial forest acres in the lower site classes. This is due to decreases in commercial forest acreage in the Ozark region, the least productive of the four survey regions.

Overall, Arkansas' forests should be able to produce 1.3 billion cubic feet of timber annually. The reality though is that they produce about 823 million cubic feet, 477 million cubic feet short of the estimated potential. On a per-acre basis this is about 50 cubic feet per year.

Potential productivity estimates assume that the major forest characteristics affecting tree growth (density, vigor, and diameter distribution) are balanced to optimize productivity. Rarely are these conditions met simultaneously in a given stand.

Stocking, a measure of stand density, is considered to be optimum on 54 percent of the commercial forest acres in Arkansas, given that optimum stocking is between 100 and 133 percent of the stocking standard. Thirty-six percent of the forest acres are understocked; the remaining 10 percent are overstocked. Both of these latter categories represent sites on which the forest growth potential is not optimized.

Rough and rotten trees also represent a major drain on annual growth. Fully 11 percent of the live tree volume in Arkansas is in rough and rotten trees.

Finally, annual growth is also affected by the diameter distribution of the trees in the stand. For example, in the Southwest region where 52 percent of the stands are sawtimber stands, gross growth is 77 percent of potential growth. In the Ozarks though, where 25 percent of the stands are sawtimber stands, gross growth is 58 percent of potential growth.

TIMBER PRODUCTS OUTPUT

"Timber products output" refers to the total amount of timber harvested in Arkansas in 1977. These figures include not only growing stock volumes on commercial forest land, but also volumes from other sources, such as cull trees, salvable dead trees, limbs and from trees on non-commercial and non-forested lands.

In 1977 Arkansas' forests provided 32 percent more roundwood products than they did in 1968. The latest forest industry survey shows that 517 million cubic feet of roundwood were produced (Bertelson 1980). Output of sawlogs and pulpwood accounted for 88 percent of the total roundwood production (fig. 10). Slightly less than one-tenth of the output was in veneer logs and bolts. The majority of the remaining output was in commercial poles and posts and miscellaneous products.

Sawlogs

Production of sawlogs in Arkansas increased 34 percent since 1968, from 1.2 to 1.6 billion board feet. Softwoods, predominantly pine, accounted for three-fourths of the total output in 1977 versus 64 percent in 1968.

Hardwoods underwent a net increase in sawtimber-size trees while sawlog production decreased by 42 million board feet. Some of this is due to changes in accessibility. In the Ouachitas for example, extraction of hardwoods may cause too much damage to the surrounding softwoods. In the Delta region and parts of the Ozark region, scattered locations reduce harvesting efficiency.

Veneer Logs and Bolts

Arkansas' forests supplied about 310 million board feet of veneer quality timber to forest industries in 1977. This volume represents a 37 percent increase over the 1968 production.

Reflecting technological changes since the early 1960's, the production of softwood veneer logs and bolts has increased 46 percent to about 302 million board feet since 1968.

Hardwood veneer output suffered a 58 percent decrease over the last decade, dropping from roughly 20 million board feet to about 8 million. Much of this decline is a result of a diminishing hardwood resource coupled with changes in species composition. Highly valuable species, such a black walnut, are not as available as they were 10 and 20 years ago.

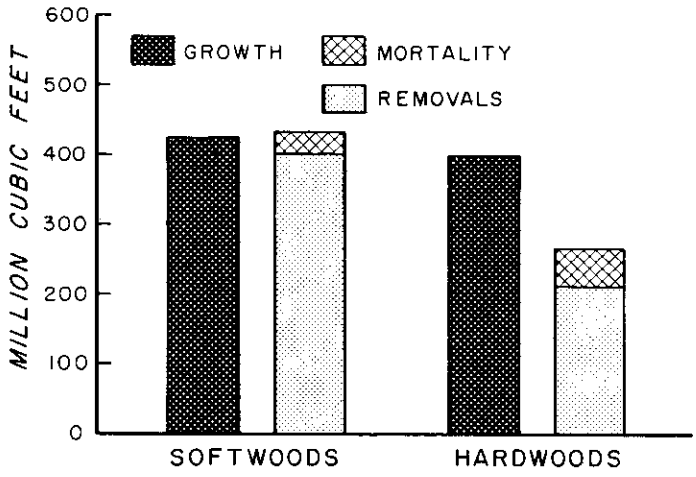
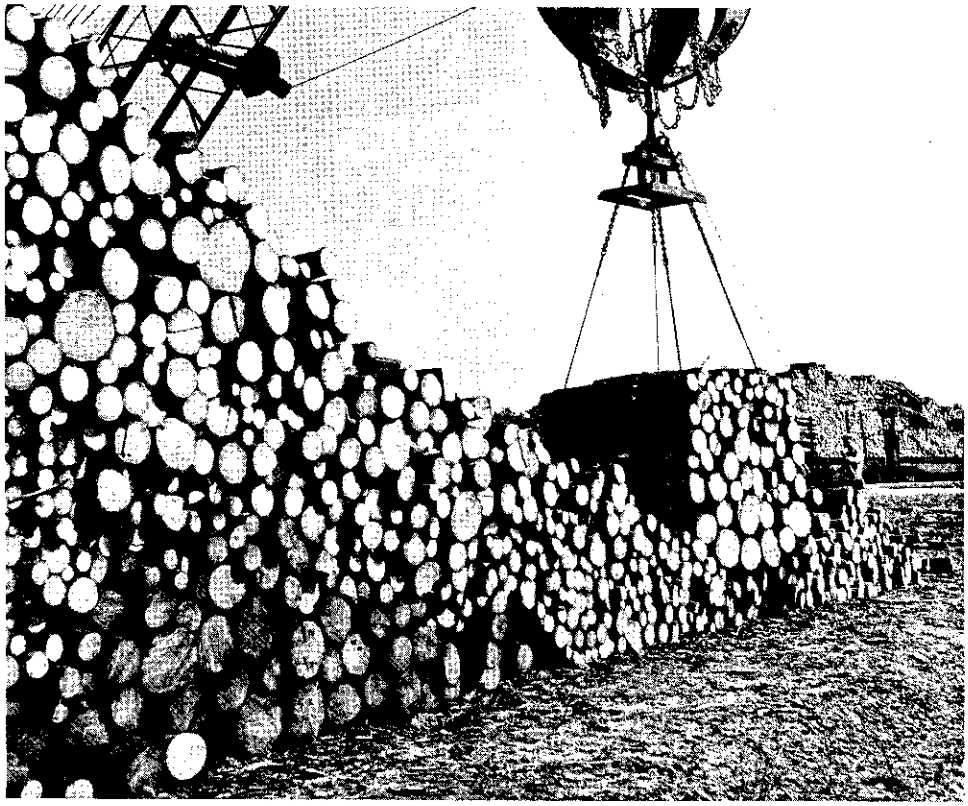


Figure 9.—*Growth, mortality, and removals of growing stock, Arkansas, 1978.*



Forest products increase—output from roundwood increased over 30 percent. Sawlogs were up 34 percent and pulpwood was 45 percent higher than reported in 1968. In 1978, Ashley county led the South in round pulpwood production.

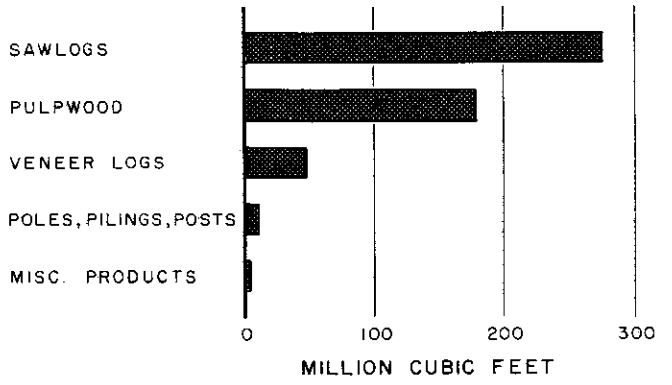


Figure 10.—*Output of Arkansas roundwood by product, 1977.*

Pulpwood

Output of pulpwood in 1977 totaled 179.1 million cubic feet, 35 percent of all roundwood production. This harvest was 45 percent higher than the 1968 harvest. Both softwood and hardwood production increased; 44 and 47 percent respectively. Oaks accounted for the majority of the hardwood production.

The increase in hardwood production is largely a result of technological changes facilitating the use of hardwoods for pulp. The softwood harvesting increase is not so much a result of major technological changes as it is of increased demand and utilization. Two new pulp mills have been constructed and existing facilities have been enlarged resulting in a doubling of Arkansas' pulping capacity (Bertelson 1980). The locations of existing facilities are shown in figure 11. The amount of pulpwood logged and shipped out of state also increased, from 377 thousand standard cords to 618 thousand.

Other Products

Arkansas' timber resource is converted into a variety of products other than those already mentioned. Some products, such as cooperage, pilings, and posts, which in the past accounted for a noticeable segment of total roundwood output, are presently produced at lower levels. The 1968 output of these items was almost 3 times larger than the 1977 production. Changes in market demands, species quality, and stand composition have all affected the output of "minor" forest products.

Poles are also roundwood products itemized by the survey. The output of poles, in contrast to that of posts and pilings, increased 43 percent. All poles produced in Arkansas are pine poles.

Plant Residues and Byproducts

Evidence that forest industries are using more of the available fiber lies in the increased amounts of plant residue utilized. About 13 million cubic feet of residue went unused in 1977 compared with 47 million in 1968. Thirty percent of the unused residue is in coarse materials suitable for chipping, such as slabs, edgings, and veneer cores. The remainder is in fine materials—sawdust and shavings—not suitable for chipping.

About 97 percent of the coarse residues are presently utilized whereas 82 percent of the fines are used. Overall, about 92 percent of the plant residues are currently utilized. In 1968 only three-fourths of the coarse and half of the fine residues were used. Presently most of the coarse residues are used for pulp fiber while most of the fine residues are burned for fuel.

Almost one million green tons of bark, pulpwood bark excluded, were generated by Arkansas' forest industries in 1977. Eight hundred thousand tons, including a softwood bark total of 600 thousand tons, were utilized.

TIMBER MANAGEMENT OPPORTUNITIES

Over the past decade production and consumption of Arkansas's timber resource have increased, due largely to intensified management and better utilization. A combination of intensified management on presently productive forest land and reversion or conversion of additional acreage into productive forest land will be required to maintain this trend.

Pine Stand Improvement

Hardwood and mixed pine-hardwood forest types growing on pine sites present a variety of timber management options for forest managers. Of the 10.6 million acres of pine site land, 6.4 million acres support oak-pine and oak-hickory stands. Some stands are so poorly stocked with growing stock trees that immediate conversion is the best management option. Others are sufficiently productive to manage until the hardwoods are harvested; at which time conversion to pine would improve timber productivity.

Full stocking is considered to be between 100 and 133 percent of the stocking standard. By this definition, 3.1 million acres of the 10.6 million capable of growing pine are fully stocked with growing stock trees. However, 1.1 million fully stocked acres have an inadequate pine seed source indicating that if the majority of the stocking is not now hardwood, it may well be in the future. Regeneration to pine will require site preparation and planting. Including all stocking levels, there are 5.8 million acres with an inadequate pine seed source to provide natural pine regeneration.

Good candidates for pine management intensification include those sites fully stocked and having an adequate pine seed source. The existence of an adequate seed source can reduce regeneration costs appreciably. Roughly two million acres fall in this category. Regeneration of a new stand can occur naturally, how-

ever, hardwood control may be needed to release understory pine or pine seedling competition.

Additional candidates for pine management intensification include those sites that, although they have an adequate pine seed source, are either over- or understocked with growing stock trees. About 370,000 such acres are overstocked whereas 2.4 million are less than fully stocked. The bulk of any timber management activity on these sites would be directed to increasing the pine stocking.

The most difficult and expensive resource manipulation tasks are on those sites with inadequate pine seed sources and forested with hardwood stands. Management options on these sites include overstory removal, if an overstory exists, by harvesting or timber stand improvement to allow site preparation and planting. And if there is no mature overstory, sites can be prepared for planting.

Much attention is given to management opportunities oriented towards stand improvement and/or conversion. Alternatively, forest managers could concentrate more effort on insuring adequate pine regeneration after harvest. Such procedures, although not guaranteed to produce increasing inventories, would help to maintain current harvest levels.

Hardwood Improvement

In Arkansas there are almost as many acres of upland hardwood sites as there are bottomland hardwood sites; each encompasses about 3 million acres. More than 90 percent of these sites have pure hardwood forest growing on them. Thus the best option for site productivity improvement is enhancement of existing stands, not necessarily type conversion. The fact that about 40 percent of all live hardwood trees are classed rough and rotten is testimony to the neglect the hardwood resource has suffered.

To help evaluate the condition of the hardwood acreage, Arkansas' forest land was classified according to the amount of stocking by desirable trees. A desirable tree is a growing stock tree that is vigorous, has no defects that would seriously limit its use and contains no pathogens that would cause death or serious degrade before rotation age. Growing stock trees not classed "desirable" are classed "acceptable".

Primary targets for increased management are hardwood sites that are at least medium stocked with desirable trees. There are about 44,000 such acres. Efforts on these acres should be directed to stand quality improvement by removing or killing less

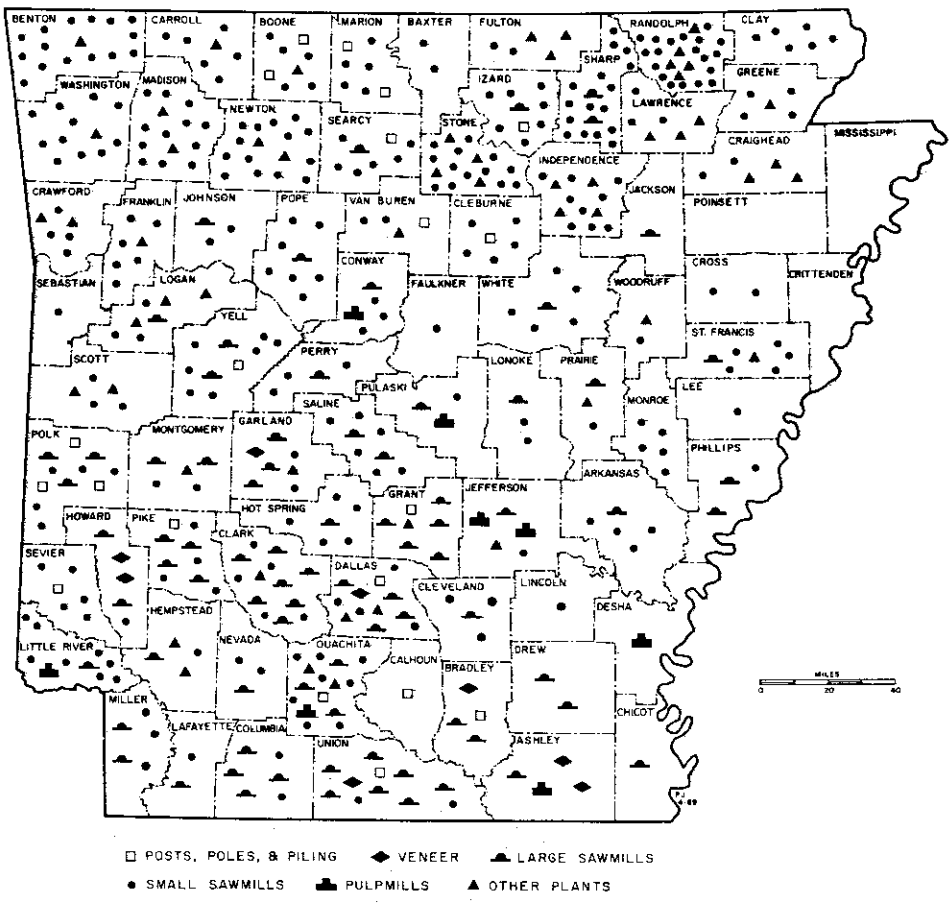


Figure 11.—*Primary wood-using plants in Arkansas, 1977.*

Pine stand improvement—successful regeneration of this pine stand will require some form of hardwood control.

preferred stems. Some acres will require little improvements whereas others, such as the overstocked acres, will require larger amounts of treatment. Some revenue may be generated through these efforts, but some small landowners will find the efforts financially unfeasible.

There are 1.2 million acres at least medium stocked with growing stock trees but poorly stocked with desirable trees. Stand improvement is possible on these sites but will require removal of cull trees and less desirable growing stock trees.

There are 1.8 million acres poorly stocked with growing stock trees. In some cases it may be possible to treat the existing stand to restore it to health, but many acres are so poorly stocked that conversion to a new stand is the best option. Treatments applied to these stands likely will require substantial financial investments.

Resource Outlook

Arkansas' commercial forest land base continued its decline over the past decade. This trend will most likely continue in the face of urbanization, clearing for agriculture, and other non-forestry oriented land uses.

Although there was an overall decline in the number of softwood growing stock trees, all in the small diameter classes, growing stock volume increased. This indicates maturation of existing stands. To insure continued or even increased supplies of softwood timber, the number of small trees must be augmented now. Since net annual growth exceeded removals by about 20 million cubic feet, the pine resource could conceivably withstand a slight increase in cutting.

Prospects for the hardwood resource are mixed. Although total growing stock volume decreased only 2 percent, quality declines and species composition changes have been noted. Unless efforts are made to improve the quality of the hardwood resource, these trends can be expected to continue.

LITERATURE CITED

Bertelson, Daniel F.
1971. Growth components of Arkansas forests. U.S. Dep. Agric. For. Serv. Res. Note SO-114, 3 p. South. For. Exp. Stn., New Orleans, La.

Bertelson, Daniel F.
1980. Arkansas forest industries, 1977. U.S. Dep. Agric. For Serv. Resour. Bull. SO-75, 18 p. South. For. Exp. Stn., New Orleans, La.

U.S. Dep. Agric. Forest Service.
1959. Report of forest and windbarrier planting in the United States, 1958. 15 p.

U.S. Dep. Agric. Forest Service.
1975. Forest planting, seeding, and silvical treatments in the United States, 1974 report. 17 p.

U.S. Dep. Agric. Forest Service.
1979. Forest planting, seeding, and silvical treatments in the United States, 1978 report. 13 p.

Van Sickle, Charles C.
1970. Arkansas forest resource patterns. U.S. Dep. Agric. For. Serv. Resour. Bull. SO-24, 34 p. South. For. Exp. Stn., New Orleans, La.

APPENDIX

Survey Methods

The data on forest acreage and timber volume were secured by a sampling method involving a forest-nonforest classification on aerial photographs and on-the-ground measurements of trees at sample locations.The sample locations were at the intersections of a grid of lines spaced 3 miles apart. In Arkansas 157,548 photographic classifications were made and 8.923 ground sample locations were visited.

The initial estimates of forest area that were obtained with the aerial photographs were adjusted on the basis of the ground check.

A cluster of 10 variable-radius plots were installed at each ground sample location. Each sample tree on the variable-radius plots represented 3.75 square feet of basal area per acre. Trees less than 5.0 inches in diameter were tallied on fixed-radius plots around the plot centers. Together, these samples provided most of the information for the new inventory.

The plots established by the prior survey were remeasured to determine the elements of change and were the basis for estimating growth, mortality, removals, and changes in land use.

A special study was made to determine product output. It consisted of a canvass of all primary wood-using plants active in Arkansas during 1976. Out-of-state firms known to use Arkansas roundwood were also contacted. Additionally, fuel wood and other domestic uses were determined from an area sample.

Reliability of the Data

Reliability of the estimates may be affected by two types of errors. The first stems from the use of a sample to estimate the whole and from variability of the items being sampled. This is termed sampling error; it is susceptible to a mathematical evaluation of the probability of error. The second type—often referred to as reporting or estimating error—derives from mistakes in measurement, judgment, or recording, and from limitations of method or equipment. Its effects cannot be appraised mathematically, but the Renewable Resources Research Unit attempts to hold it to a minimum by proper training and good supervision, and by emphasis on careful work.

Statistical analysis of the data indicates a sampling error of plus or minus 0.3 percent for the estimate of total commercial forest area, 1.3 percent for total cubic volume, and 1.8 percent for total board-foot volume. As these totals are broken down by forest type, species, tree diameter, and other subdivisions, the possibility of error increases and is greatest for the smallest items. The order of this increase is suggested in the following tabulation, which shows the sampling error to which the timber volume and area estimates are liable, two chances out of three:

Sampling errors for commercial forest area, growing-stock and sawtimber volumes, Arkansas, 1978

Commercial forest area	Sampling error[1]	Cubic volume[2]	Sampling error[1]	Board-foot volume[3]	Sampling error[1]
Thousand acres	*Percent*	*Million cubic feet*	*Percent*	*Million board feet*	*Percent*
16,615.6	0.3	.....	...	.....	...
1,495.4	1.0	17,247.9	1.3	59,294.3	1.8
373.9	2.0	7,287.2	2.0	48,028.4	2.0
166.2	3.0	3,238.8	3.0	21,345.9	3.0
93.5	4.0	1,821.8	4.0	12,007.1	4.0
59.8	5.0	1,166.0	5.0	7,684.5	5.0
15.0	10.0	291.5	10.0	1,921.1	10.0
6.6	15.0	129.5	15.0	853.8	15.0
3.7	20.0	72.9	20.0	480.3	20.0
2.4	25.0	46.6	25.0	307.4	25.0

[1]By random sampling formula.
[2]Growing-stock volume on commercial forest land.
[3]Sawtimber volume on commercial forest land.

The sampling error to which the estimates of growth, mortality, and removals are liable, on a probability of two chances out of three, are:

Net annual growth and timber removals sampling error, Arkansas, 1977

Net annual growth				Annual removals			
Cubic volume	Sampling error[1]	Board-foot volume	Sampling error[1]	Cubic volume	Sampling error[1]	Board-foot volume	Sampling error[1]
Million cubic feet	*Percent*	*Million board feet*	*Percent*	*Million cubic feet*	*Percent*	*Million board feet*	*Percent*
792.6	1.3	.....	...	614.7	1.9	.....	...
334.9	2.0	3,313.2	2.0	554.8	2.0	2,787.3	2.3
148.8	3.0	1,472.5	3.0	246.6	3.0	1.638.3	3.0
83.7	4.0	828.3	4.0	138.7	4.0	921.6	4.0
53.6	5.0	530.1	5.0	88.8	5.0	589.8	5.0
13.4	10.0	132.5	10.0	22.2	10.0	147.4	10.0
6.0	15.0	58.9	15.0	9.9	15.0	65.5	15.0
3.3	20.0	33.1	20.0	5.5	20.0	36.9	20.0
2.1	25.0	21.2	25.0	3.6	25.0	23.6	25.0

[1]By random-sampling formula.

DEFINITIONS OF TERMS

Forest Land Class

Forest land. Land at least 16.7 percent stocked by forest trees of any size, or formerly having such tree cover and not currently developed for non-forest use.

Commercial forest land. Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization.

Nonstocked land. Commercial forest land less than 16.7 percent stocked with growing-stock trees.

Productive-reserved forest land. Productive public forest land withdrawn from timber utilization through statute or administrative regulation.

Unproductive forest land. Forest land incapable of yielding crops of industrial wood because of adverse site conditions.

Tree Species

Commercial species. Tree species currently or prospectively suitable for industrial wood products: excludes so-called weed species such as blackjack oak and blue beech.

Hardwoods. Dicotyledonous trees, usually broad-leaved and deciduous.

Softwoods. Coniferous trees, usually evergreen, having needle or scalelike leaves.

Forest Type

Longleaf-slash pine. Forests in which longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include other southern pines, oak, and gum.

Loblolly-shortleaf pine. Forests in which southern pine and eastern redcedar except longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include oak, hickory, and gum.

Oak-pine. Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking but in which softwoods, except cypress, comprise 25-50 percent of the stocking. Common associates include gum, hickory, and yellow-poplar.

Oak-hickory. Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand would be classified oak-pine. Common associates include yellow-poplar, elm, maple, and black walnut.

Oak-gum-cypress. Bottomland forest in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand would be classified oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

Elm-ash-cottonwood. Forests in which elm, ash, or cottonwood, singly or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.

Class of Timber

Growing-stock trees. Sawtimber trees, poletimber trees, saplings, and seedlings: that is, all live trees except rough and rotten trees.

Desirable trees. Growing-stock trees that have no serious defects to limit present or prospective use, are of relatively high vigor, and contain no pathogens that may result in death or serious deterioration before rotation age. They comprise the type of trees that forest managers aim to grow; that is, the trees favored in silvicultural operations.

Acceptable trees. Trees meeting the specifications for growing stock but not qualifying as desirable trees.

Sawtimber trees. Live trees of commercial species. 9.0 inches and larger in dbh for softwoods and 11.0 inches and larger for hardwoods, and containing at least one 12-foot saw log.

Poletimber trees. Live trees of commercial species 5.0 to 9.0 inches in dbh for softwoods and 5.0 to 11.0 inches for hardwoods, and of good form and vigor.

Saplings. Live trees of commercial species, 1.0 inch to 5.0 inches in dbh and of good form and vigor.

Rough and rotten trees. Live trees that are unmerchantable for saw logs now or prospectively because of defect, rot, or species.

Salvable dead trees. Standing or down dead trees that are currently or potentially merchantable.

Stand-Size Class

Sawtimber stands. Stands at least 16.7 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands. Stands at least 16.7 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber or poletimber trees, and with poletimber stocking exceeding that of sawtimber stocking.

Sapling-seedling stands. Stands at least 16.7 percent stocked with growing-stock trees, with more than half of this stocking in saplings or seedlings.

Nonstocked areas. Commercial forest lands less than 16.7 percent stocked with growing-stock trees.

Stocking

Stocking is a measure of the extent to which the growth potential of the site is utilized by trees or preempted by vegetative cover. Stocking is determined by comparing the stand density in terms of number of trees or basal area with a specified standard. Full stocking is assumed to range from 100 to 133 percent of the stocking standard.

The tabulation below shows the density standard in terms of trees per acre, by size class, required for full stocking:

Dbh (inches)	Number of trees	Dbh (inches)	Number of trees
Seedlings	600	16	72
2	560	18	60
4	460	20	51
6	340	22	42
8	240	24	36
10	155	26	31
12	115	28	27
14	90	30	24

Volume

Volume of sawtimber. Net volume of the saw-log portion of live sawtimber trees in board feet of the International rule. ¼ inch kerf.

Volume of growing stock. Volume of sound wood in the bole of sawtimber and poletimber trees from stump to a minimum 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Volume of timber. The volume of sound wood in the bole of growing stock, rough, rotten, and salvable dead trees 5.0 inches and larger in d b h from stump to a minimum 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Area Condition Class

A classification of commercial forest land based upon stocking by desirable trees and other conditions affecting current and prospective timber growth.

Class 10. Areas 100 percent or more stocked with desirable trees and overstocked.

Class 20. Areas 100 percent or more stocked with desirable trees and overstocked with all live trees.

Class 30. Areas 60 to 100 percent stocked with desirable trees and with less than 30 percent of the area controlled by other trees, inhibiting vegetation, slash, or nonstockable conditions.

Class 40. Areas 60 to 100 percent stocked with desirable trees and with 30 percent or more of the area controlled by other trees, or conditions that ordinarily prevent occupancy by desirable trees.

Class 50. Areas less than 60 percent stocked with desirable trees, but with 100 percent or more stocking of growing-stock trees.

Class 60. Areas less than 60 percent stocked with desirable trees, but with 60 to 100 percent stocking of growing-stock trees.

Class 70. Areas less than 60 percent stocked with desirable trees and with less than 60 percent stocking of growing-stock trees.

Miscellaneous Definitions

Basal area. The area in square feet of the cross section at breast height of a single tree or of all the trees in a stand, usually expressed as square feet per acre.

Dbh (Diameter breast high). Tree diameter in inches, outside bark, measured at 4½ feet above ground.

Diameter classes. The 2-inch diameter classes extend from 1.0 inch below to 9.0 inch above the stated midpoint. Thus, the 12-inch class includes trees 11.0 inches through 12.9 inches dbh.

Site classes. A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Log grades. A classification of logs based on external characteristics as indicators of quality or value.

Gross growth. Annual increase in net volume of trees in the absence of cutting and mortality.

Net annual growth. The increase in volume of a specified size class for a specific year. Components of net annual growth include the increment in net volume of trees at the beginning of the specific year surviving to its end plus volume of trees reaching the size class during the year minus the volume of trees that died during the year minus the net volume of trees that become rough or rotten during the year.

Mortality. Number or sound-wood volume of live trees dying from natural causes during a specified period.

Timber removals. The net volume of growing-stock trees removed from the inventory by harvesting, cultural operations such as timber-stand improvement, land clearing, or changes in land use.

Timber products. Roundwood products and plant byproducts. Timber products output includes roundwood products cut from growing stock on commercial forest land; from other sources, such as cull trees, salvable dead trees, limbs, and saplings; from trees on noncommercial and nonforest lands; and from plant byproducts.

Roundwood products. Logs, bolts, and other round sections cut from trees for industrial or consumer uses. Included are saw logs, veneer logs and bolts, cooperage logs and bolts, pulpwood, fuelwood, piling, poles and posts, hewn ties, mine timbers, and various other round, split, or hewn products.

Logging residues. The unused portions of trees cut or killed by logging.

Plant byproducts. Wood products, such as pulp chips, obtained incidental to manufacture of other products.

Plant residues. Wood materials from manufacturing plants not utilized for some product. Included are slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screening.

STANDARD TABLES

Table 1.—*Area by land classes, Arkansas, 1978*

Land Class	Area
	Thousand acres
Forest	
Commercial	16,615.6
Productive-reserved	243.7
Unproductive	516.7
Total forest	17,376.0
Nonforest:	
Cropland[1]	9,652.1
Other[2]	6,217.1
Total nonforest	15,869.2
All land[3]	33,245.2

[1]Census of Agriculture.
[2]Includes pasture and range, industrial and urban areas, other nonforest land, and 296,925 acres, classed as water by Forest Survey standards, but defined by the Bureau of the Census as land.
[3]United States Bureau of the Census.

Table 2.—*Area of commercial forest land by ownership classes, Arkansas, 1978*

Ownership Class	Area
	Thousand acres
Public	
National forest	2,349.2
Bureau of Land Management	1.2
Indian	.....
Other federal	249.0
State	300.3
County and municipal	17.3
Total public	2,917.0
Private:	
Forest industry[1]	4,232.6
Farmer	2,978.9
Miscellaneous private:	
Individual	5,774.3
Corporate	712.8
Total private	13,698.6
All ownerships	16,615.6

[1]Not including 5 thousand acres of farmer-owned and miscellaneous private lands leased to forest industry.

Table 3.—*Area of commercial forest land by stand-size and ownership classes, Arkansas, 1978*

Stand-size class	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	Thousand acres				
Sawtimber	6,983.5	1,063.4	356.6	2,175.8	3,387.7
Poletimber	5,472.3	953.1	101.0	879.0	3,539.2
Sapling and seedling	4,046.7	332.7	106.3	1,151.1	2,456.6
Nonstocked areas	113.1	.....	3.9	26.7	82.5
All classes	16,615.6	2,349.2	567.8	4,232.6	9,466.0

Table 4.—*Area of commercial forest land by stand-volume and ownership classes, Arkansas, 1978*

Stand-volume per acre[1]	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	Thousand acres				
Less than 1,500 fbm	6,419.6	675.6	142.1	1,235.2	4,366.7
1,500 to 5,000 fbm	5,813.9	984.5	188.2	1,256.3	3,384.9
More than 5,000 fbm	4,382.1	689.1	237.5	1,741.1	1,714.4
All classes	16,615.6	2,349.2	567.8	4,232.6	9,466.0

[1]International ¼-inch rule.

Table 5.—*Area of commercial forest land by stocking classes based on selected stand components, Arkansas, 1978*

Stocking percentage	Stocking classified in terms of					
	All trees	Growing-stock trees			Rough and rotten trees	Inhibiting vegetation
		Total	Desirable	Acceptable		
	Thousand acres					
160 or more	37.4	15.8	. . . . .	. . . . .	. . . . .	. . . . .
150 to 160	97.7	44.9	. . . . .	4.9	. . . . .	. . . . .
140 to 150	349.0	112.2	. . . . .	33.3	. . . . .	. . . . .
130 to 140	1,096.3	319.2	6.5	29.0	. . . . .	. . . . .
120 to 130	2,097.7	780.8	21.0	126.6	. . . . .	. . . . .
110 to 120	3,450.7	1,160.5	27.3	404.9	. . . . .	. . . . .
100 to 110	3,440.9	1,822.6	49.1	792.0	11.9	. . . . .
90 to 100	2,801.9	2,389.3	84.6	1,493.0	21.7	. . . . .
80 to 90	1,781.9	2,667.7	127.6	2,014.1	27.9	. . . . .
70 to 80	848.6	2,383.0	195.6	2,601.4	132.4	. . . . .
60 to 70	336.4	1,933.8	317.8	2,615.5	212.3	4.3
50 to 60	139.3	1,348.6	500.3	2,384.5	614.9	. . . . .
40 to 50	65.9	835.7	647.5	1,742.4	1,288.9	. . . . .
30 to 40	24.2	439.7	1,043.9	1,295.5	2,313.1	5.2
20 to 30	27.6	217.3	1,940.1	672.7	3,456.7	12.8
10 to 20	4.3	95.1	3,023.9	258.6	4,491.3	103.8
Less than 10	15.8	49.4	8,630.4	147.2	4,044.5	16,489.5
All areas	16,615.6	16,615.6	16,615.6	16,615.6	16,615.6	16,615.6

Table 6.—*Area of commercial forest land by area-condition and ownership classes, Arkansas, 1978*

Area-condition class	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	Thousand acres				
10	98.0	11.2	. . . .	64.1	22.7
20	5.9	5.9	. . . .	. . . . .	. . . . .
30	63.0	11.1	4.7	35.3	11.9
40	662.6	106.1	2.9	363.8	189.8
50	3,532.0	610.9	82.3	1,196.3	1,642.5
60	9,268.3	1,332.8	306.8	2,076.6	5,552.1
70	2,985.8	271.2	171.1	496.5	2,047.0
All classes	16,615.6	2,349.2	567.8	4,232.6	9,466.0

Table 7.—*Area of commercial forest land by site and ownership classes, Arkansas, 1978*

Site class	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	Thousand acres				
165 ft³ or more	235.6	.....	9.3	109.5	116.8
120 to 165 ft³	1,303.1	11.5	91.4	492.0	708.2
85 to 120 ft³	4,636.9	236.7	139.4	1,910.8	2,350.0
50 to 85 ft³	6,509.5	1,343.3	232.2	1,439.0	3,495.0
Less than 50 ft³	3,930.5	757.7	95.5	281.3	2,796.0
All classes	16,615.6	2,349.2	567.8	4,232.6	9,466.0

Table 8.—*Area of commercial forest land by forest types and ownership classes, Arkansas, 1978*

Type	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
	Thousand acres				
Loblolly-shortleaf pine	4,277.0	795.0	37.7	1,830.4	1,613.9
Oak-pine	2,966.6	468.6	32.3	938.5	1,527.2
Oak-hickory	6,537.5	1,074.4	161.8	677.9	4,623.4
Oak-gum-cypress	2,628.0	5.7	309.7	743.2	1,569.4
Elm-ash-cottonwood	206.5	5.5	26.3	42.6	132.1
All types	16,615.6	2,349.2	567.8	4,232.6	9,466.0

Table 9.—*Area of noncommercial forest land by forest types, Arkansas, 1978*

Type	All areas	Productive-reserved areas	Unproductive areas
	Thousand acres		
Loblolly-shortleaf pine	104.1	97.7	6.4
Oak-pine	170.3	38.0	132.3
Oak-hickory	470.2	98.2	372.0
Oak-gum-cypress	15.8	9.8	6.0
All types	760.4	243.7	516.7

Table 10. — *Number of growing-stock trees on commercial forest land by species and diameter classes, Arkansas, 1978*

Species	Diameter class (inches at breast height)										
	All classes	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Thousand Trees										
Softwood:											
Shortleaf pine	372,743	121,489	96,202	70,771	45,234	23,153	9,938	4,147	1,252	557	. . .
Loblolly pine	317,800	117,383	79,097	47,408	29,462	18,435	12,764	6,723	3,724	2,732	72
Cypress	7,556	750	1,829	1,275	1,193	639	616	434	202	390	228
Redcedar	29,579	19,485	6,696	1,773	1,161	341	81	26	16	. . . .	. . .
Total	727,678	259,107	183,824	121,227	77,050	42,568	23,399	11,330	5,194	3,679	300
Hardwood:											
Select white oaks[1]	188,900	85,553	49,483	25,621	12,874	7,383	4,214	2,232	777	733	30
Select red oaks[2]	69,452	23,857	16,868	11,469	6,360	4,103	2,716	1,715	1,176	1,119	69
Other white oaks	161,780	74,661	40,941	22,065	9,881	6,847	2,991	1,819	1,094	1,389	92
Other red oaks	212,153	78,372	53,375	31,517	19,195	12,046	8,211	4,321	2,467	2,427	222
Pecan	13,038	4,541	3,608	1,558	1,051	710	600	298	224	378	70
Other hickories	139,129	70,436	34,124	18,214	7,913	4,889	2,053	868	326	286	20
Sweetgum	143,983	62,721	36,452	19,917	11,517	6,794	3,525	1,656	874	480	47
Tupelo and blackgum	34,478	14,248	8,503	4,920	2,526	1,789	1,352	453	351	313	23
Hard maple	5,439	3,143	1,268	615	204	115	71	23	. . . .	. . . .	. . .
Soft maple	12,327	7,099	2,722	1,588	368	276	118	71	54	26	5
Beech	2,098	323	356	467	259	212	148	114	107	102	10
Ash	25,953	10,956	6,366	3,875	1,791	1,251	677	401	221	387	28
Cottonwood	4,889	1,492	1,201	380	194	292	321	367	332	281	29
Basswood	806	331	54	196	22	109	44	44	. . . .	6	. . .
Yellow-poplar	200	. . . . .	. . . . .	84	. . . . .	32	54	. . . . .	. . . .	21	9
Black walnut	2,561	950	794	371	170	158	89	23	. . . .	6	. . .
Black cherry	4,220	1,880	1,221	683	225	156	14	14	19	8	. . .
Willow	6,210	2,246	982	422	458	755	516	470	169	184	8
Magnolia *(magnolia spp.)*	2,186	931	543	442	155	63	29	23	. . . .	. . . .	. . .
American elm	13,994	6,122	3,203	2,085	1,107	686	335	214	116	119	7
Other elms	31,317	18,213	7,377	3,399	1,260	609	170	139	95	55	. . .
Hackberry	17,639	4,904	4,874	3,046	1,729	1,118	892	584	248	238	6
Sycamore	3,917	1,197	876	381	530	339	192	129	89	176	8
Other hardwoods	24,826	13,557	5,701	2,982	1,272	641	387	144	55	79	8
Total	1,121,495	487,733	280,892	156,297	81,061	51,373	29,719	16,122	8,794	8,813	691
All species	1,849,173	746,840	464,716	277,524	158,111	93,941	53,118	27,452	13,988	12,492	991

[1]Includes white, swamp chestnut, swamp white, chinkapin, Durand, and bur oaks.
[2]Includes cherry bark, Shumard, and northern red oaks.

Table 11 — *Volume of timber on commercial forest land by class of timber and by softwoods and hardwoods, Arkansas, 1978*

Class of timber	All species	Softwood	Hardwood
	Million cubic feet		
Sawtimber trees:			
Saw-log portion	10,024.2	5,850.9	4,173.3
Upper-stem portion	1,432.0	529.4	902.6
Total	11,456.2	6,380.3	5,075.9
Poletimber trees	5,791.7	1,787.7	4,004.0
All growing stock	17,247.9	8,168.0	9,079.9
Rough trees	1,567.4	107.8	1,459.6
Rotten trees	577.2	19.4	557.8
Salvable dead trees	6.0	3.4	2.6
All timber	19,398.5	8,298.6	11,099.9

Table 12. — *Volume of growing stock and sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Arkansas, 1978*

Ownership class	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million cubic feet			*Million board feet*		
National forest	2,827.2	1,558.8	1,268.4	9,252.9	6,223.8	3,029.1
Other public	641.6	163.2	478.4	2,564.8	785.6	1,779.2
Forest industry	5,217.9	3,180.4	2,037.5	20,803.1	14,405.4	6,397.7
Farmer and misc. private	8,561.2	3,265.6	5,295.6	26,673.5	12,783.8	13,889.7
All ownerships	17,247.9	8,168.0	9,079.9	59,294.3	34,198.6	25,095.7

Table 13. — *Volume of growing stock on commercial forest land by species and diameter classes, Arkansas, 1978*

Species	Diameter class (inches at breast height)										
	All classes	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Million cubic feet										
Softwood:											
Shortleaf pine	4,089.7	319.3	613.3	876.8	873.3	654.4	397.0	220.0	83.5	52.1	.....
Loblolly pine	3,776.9	309.1	470.2	542.7	553.9	516.3	506.2	348.4	252.4	262.3	15.4
Cypress	202.7	1.4	11.6	14.0	17.9	18.1	22.1	20.7	11.0	30.6	55.3
Redcedar	98.7	36.9	25.9	13.8	13.8	5.3	1.6	.7	.7	.....	.....
Total	8,168.0	666.7	1,121.0	1,447.3	1,458.9	1,194.1	926.9	589.8	347.6	345.0	70.7
Hardwood:											
Select white oaks	1,374.7	211.2	265.8	248.2	202.2	155.7	122.6	81.6	36.9	46.0	4.5
Select red oaks	750.3	58.5	92.5	108.9	96.6	90.8	84.7	69.2	61.6	78.3	9.2
Other white oaks	1,059.2	157.6	192.7	180.5	131.3	126.8	75.9	59.5	45.9	77.6	11.4
Other red oaks	2,057.4	187.0	285.2	299.7	294.7	258.7	247.6	161.5	116.4	175.0	31.6
Pecan	157.7	10.1	18.1	15.8	15.3	14.6	18.4	11.8	9.9	32.8	10.9
Other hickories	794.2	128.6	152.8	156.5	113.9	102.7	59.4	36.1	17.8	23.6	2.8
Sweetgum	1,305.5	138.3	210.0	221.6	220.6	187.9	138.4	82.3	54.3	42.5	9.6
Tupelo and blackgum	284.5	28.1	41.4	44.7	37.7	38.4	39.8	16.5	16.4	19.4	2.1
Hard maple	29.9	8.3	7.2	6.0	2.8	2.8	1.8	1.0	.....	.....	.....
Soft maple	66.2	17.2	13.7	14.0	5.8	5.9	3.1	2.1	2.5	1.4	.5
Beech	39.0	.8	1.7	4.5	4.1	4.6	4.7	4.4	5.7	7.4	1.1
Ash	220.9	24.0	35.2	35.1	27.7	26.2	20.0	16.3	10.0	23.4	3.0
Cottonwood	109.4	3.6	7.0	4.4	3.1	7.2	13.3	19.6	21.1	26.0	4.1
Basswood	11.4	.7	.3	2.2	.4	2.7	1.8	2.4	.....	.9	.....
Yellow-poplar	6.6	.....	.....	1.0	.....	.9	1.6	.....	.....	2.0	1.1
Black walnut	16.3	1.7	3.4	2.9	2.5	2.9	1.8	.7	.....	.4	.....
Black cherry	26.7	5.3	6.1	6.4	3.6	3.3	.4	.6	.5	.5	.....
Willow	97.7	4.7	5.0	4.3	8.1	18.5	15.4	19.8	8.3	12.8	.8
Magnolia *(magnolia spp.)*	18.2	3.1	3.8	5.3	2.7	1.1	1.2	1.0	.....	.....	.....
American elm	108.5	14.5	14.6	17.3	15.6	14.3	9.4	8.0	5.3	8.4	1.1
Other elms	157.5	37.5	36.8	32.8	17.8	12.4	6.0	5.5	4.4	4.3	.....
Hackberry	187.6	10.6	23.8	26.1	25.3	23.1	26.8	22.9	12.6	15.8	.6
Sycamore	59.8	3.4	5.5	3.8	9.3	7.7	5.8	5.6	4.2	13.7	.8
Other hardwoods	140.7	27.4	27.7	29.5	18.6	12.9	10.6	6.5	2.1	4.2	1.2
Total	9,079.9	1,082.2	1,450.3	1,471.5	1,259.7	1,122.1	910.5	634.9	435.9	616.4	96.4

Table 14.—*Volume of sawtimber on commercial forest land by species and diameter classes, Arkansas, 1978.*

Species	Diameter class (inches at breast height)								
	All classes	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0 and larger
	Million board feet								
Softwood:									
Shortleaf pine	16,833.2	4,008.2	4,607.4	3,708.0	2,331.6	1,340.2	508.2	329.6	.....
Loblolly pine	16,236.9	2,276.4	2,844.7	2,867.1	2,923.2	2,069.2	1,533.4	1,619.3	103.6
Cypress	981.9	45.1	75.2	81.0	118.7	110.8	60.8	170.6	319.7
Redcedar	146.6	50.4	58.2	24.2	6.9	3.4	3.5	.....	.....
Total	34,198.6	6,380.1	7,585.5	6,680.3	5,380.4	3,523.6	2,105.9	2,119.5	423.3
Hardwood:									
Select white oaks	3,200.7	.....	877.4	738.7	636.3	442.5	211.3	266.0	28.5
Select red oaks	2,500.2	.....	400.1	437.0	448.0	368.6	343.6	447.0	55.9
Other white oaks	2,615.0	.....	554.9	605.0	383.3	320.7	248.0	435.6	67.5
Other red oaks	6,347.7	.....	1,198.0	1,216.3	1,262.5	857.5	638.3	986.9	188.2
Pecan	613.1	.....	60.7	68.7	95.4	64.1	58.5	198.0	67.7
Other hickories	1,763.5	.....	485.0	498.9	319.7	203.5	103.6	140.6	12.2
Sweetgum	3,595.1	.....	839.4	916.7	743.0	461.7	320.3	258.1	55.9
Tupelo and blackgum	813.1	.....	141.7	178.2	199.7	86.2	85.2	109.5	12.6
Hard maple	35.7	.....	9.8	12.0	8.7	5.2	.....	.....	.....
Soft maple	97.1	.....	25.7	26.8	13.5	10.3	13.1	6.0	1.7
Beech	177.1	.....	16.8	24.6	25.3	24.2	31.5	45.1	9.6
Ash	579.9	.....	103.2	114.0	96.6	82.0	48.3	119.5	16.3
Cottonwood	521.6	.....	11.3	33.0	76.5	110.0	117.8	151.3	21.7
Basswood	44.7	.....	1.7	12.6	10.5	13.2	.....	6.7	.....
Yellow-poplar	31.0	.....	.....	4.6	8.1	.....	.....	11.7	6.6
Black walnut	32.8	.....	8.0	10.7	8.6	3.9	.....	1.6	.....
Black cherry	43.4	.....	16.7	15.2	2.4	3.1	3.0	3.0	.....
Willow	439.6	.....	32.4	89.0	82.7	115.6	45.4	70.4	4.1
Magnolia (*magnolia spp.*)	29.0	.....	12.5	4.1	6.8	5.6	.....	.....	.....
American elm	301.2	.....	63.4	67.5	43.8	42.6	28.8	49.1	6.0
Other elms	252.5	.....	73.4	63.3	33.9	30.7	26.4	24.8	.....
Hackberry	581.2	.....	94.8	98.6	128.3	111.5	62.9	81.7	3.4
Sycamore	226.8	.....	37.7	33.1	26.6	29.6	20.9	74.3	4.6
Other hardwoods	253.7	.....	73.5	57.5	49.5	31.9	10.5	22.4	8.4
Total	25,095.7	.....	5,138.1	5,326.1	4,709.7	3,424.2	2,417.4	3,509.3	570.9
All species	59,294.3	6,380.1	12,723.6	12,006.4	10,090.1	6,947.8	4,523.3	5,628.8	994.2

Table 15.—*Volume of sawtimber on commercial forest land by species and log grade, Arkansas, 1978*

Species	All grades	Grade 1	Grade 2	Grade 3	Grade 4
			Million board feet		
Softwood:					
Yellow pines	33,070.1	4,844.7	5,319.8	22,905.6	. . . . .
Red	146.6	146.6	. . . . .	. . . . .	. . . . .
Cypress	981.9	159.9	181.0	641.0	. . . . .
Total	34,198.6	5,151.2	5,500.8	23,546.6	. . . . .
Hardwood:					
Select white and red oaks	5,700.9	593.9	1,018.1	2,626.4	1,462.5
Other white and red oaks	8,962.7	746.7	1,364.7	4,061.3	2,790.0
Hickory	2,376.6	260.7	389.1	1,116.6	610.2
Hard maple	35.7	2.1	5.4	20.9	7.3
Sweetgum	3,595.1	417.2	596.5	1,753.1	828.3
Tupelo and blackgum	813.1	142.7	171.3	380.2	118.9
Ash, walnut, and black cherry	656.1	125.9	135.1	322.2	72.9
Yellow-poplar	31.0	8.4	7.7	11.9	3.0
Other hardwoods	2,924.5	441.6	551.5	1,287.5	643.9
Total	25,095.7	2,739.2	4,239.4	11,580.1	6,537.0
All species	59,294.3	7,890.4	9,740.2	35,126.7	6,537.0

Table 16.—*Annual growth and removals of growing stock on commercial forest land by species, Arkansas, 1977*

Species	*Net annual growth*	*Annual removals*
	Million cubic feet	
Softwood:		
Yellow pines	409.2	396.2
Cypress	5.6	3.1
Other softwoods	8.7	5.1
Total	423.5	404.4
Hardwoods:		
Select white and red oaks	89.0	40.0
Other white and red oaks	138.7	90.6
Hickory	33.2	20.7
Hard maple	1.2	. . . .
Sweetgum	48.7	25.8
Tupelo and blackgum	7.9	5.3
Ash, walnut, and black cherry	10.5	5.7
Yellow-poplar	.2	.1
Other hardwoods	39.7	22.1
Total	369.1	210.3
All species	792.6	614.7

Table 17.—*Annual growth and removals of growing stock on commercial forest land by ownership classes and by softwoods and hardwoods, Arkansas, 1977*

Ownership class	Net annual growth			Annual removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
			Million cubic feet			
National forest	91.6	48.1	43.5	38.5	30.8	7.7
Other public	24.7	6.8	17.9	17.6	7.8	9.8
Forest industry	251.4	167.8	83.6	280.7	215.4	65.3
Farmer and misc. private	424.9	200.8	224.1	277.9	150.4	127.5
All ownerships	792.6	423.5	369.1	614.7	404.4	210.3

Table 18.—*Annual growth and removals of sawtimber on commercial forest land by species, Arkansas, 1977*

Species	Net annual growth	Annual removals
	Million board feet	
Softwood:		
Yellow pines	2,043.8	1,949.6
Cypress	27.3	25.1
Other softwoods	11.9	16.9
Total	2,083.0	1,991.6
Hardwood:		
Select white and red oaks	298.9	163.4
Other white and red oaks	494.8	348.6
Hickory	98.9	71.1
Hard maple	1.0	.....
Sweetgum	149.5	93.9
Tupelo and blackgum	17.3	20.8
Ash, walnut, and black cherry	37.3	20.7
Yellow-poplar	1.3	.4
Other hardwoods	131.2	76.7
Total	1,230.2	795.6
All species	3,313.2	2,787.2

Table 19.—*Annual growth and removals of sawtimber on commercial forest land by ownership classes and by softwoods and hardwoods, Arkansas, 1977*

Ownership class	Net annual growth			Annual removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million board feet					
National forest	360.5	229.1	131.4	200.2	160.4	39.8
Other public	119.0	44.9	74.1	79.2	38.8	40.4
Forest industry	1,190.5	895.4	295.1	1,354.6	1,125.0	229.6
Farmer and misc. private	1,643.2	913.6	729.6	1,153.2	667.4	485.8
All ownerships	3,313.2	2,083.0	1,230.2	2,787.2	1,991.6	795.6

Table 20.—*Mortality of growing stock and sawtimber on commercial forest land by species, Arkansas, 1977*

Species	Growing stock	Sawtimber
	Million cubic feet	*Million board feet*
Softwoods:		
Yellow pines	26.3	70.9
Cypress	.5	2.3
Other softwoods	.6	.8
Total	27.4	74.0
Hardwoods:		
Select white and red oaks	6.7	19.9
Other white and red oaks	13.8	45.8
Hickory	4.4	9.5
Hard maple	.3	1.5
Sweetgum	6.9	19.8
Tupelo and blackgum	1.6	6.2
Ash, walnut, and black cherry	2.8	7.1
Other hardwoods	19.6	59.4
Total	56.1	169.2
All species	83.5	243.2

Table 21.—*Mortality of growing stock and sawtimber on commercial forest land by ownership class and by softwoods and hardwoods, Arkansas, 1977*

Ownership class	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million cubic feet			*Million board feet*		
National forest	9.0	3.3	5.7	25.4	8.8	16.6
Other public	6.1	.3	5.8	24.0	.8	23.2
Forest industry	24.5	12.8	11.7	78.2	39.1	39.1
Farmer and misc. private	43.9	11.0	32.9	115.6	25.3	90.3
All ownerships	83.5	27.4	56.1	243.2	74.0	169.2

Table 22.—*Mortality of growing stock and sawtimber on commercial forest land by causes and by softwoods and hardwoods, Arkansas, 1977*

Cause of death	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million cubic feet			*Million board feet*		
Fire	2.1	.7	1.4	3.0	2.4	.6
Insects	6.6	6.2	.4	24.1	22.7	1.4
Disease	34.6	6.2	28.4	103.3	15.9	87.4
Other	33.7	12.2	21.5	100.6	28.3	72.3
Unknown	6.5	2.1	4.4	12.2	4.7	7.5
All causes	83.5	27.4	56.1	243.2	74.0	169.2

Table 23.—*Total output of timber products by product, by type of material used, and by softwoods and hardwoods, Arkansas, 1977.*

Product and species group	Standard units	Total output		Roundwood products		Plant byproducts	
		Number	M ft³	Number	M ft³	Number	M ft³
Saw logs:							
Softwood	M fbm[1]	1,290,318	211,647	1,213,992	205,286	76,326	6,361
Hardwood	M fbm[1]	406,684	69,502	406,684	69,502	. . . . .	. . . . .
Total	M fbm[1]	1,697,002	281,149	1,620,676	274,788	76,326	6,361
Veneer logs and bolts:							
Softwood	M fbm	301,758	47,195	301,758	47,195	. . . . .	. . . . .
Hardwood	M fbm	8,428	1,414	8,428	1,414	. . . . .	. . . . .
Total	M fbm	310,186	48,609	310,186	48,609	. . . . .	. . . . .
Pulpwood:							
Softwood	Std cd[2]	2,573,003	208,413	1,454,603	117,823	1,118,400	90,590
Hardwood	Std cd[2]	925,593	74,047	765,593	61,247	160,000	12,800
Total	Std cd	3,498,596	282,460	2,220,196	179,070	1,278,400	103,390
Cooperage:							
Softwood	M fbm	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Hardwood	M fbm	2,159	311	2,159	311	. . . . .	. . . . .
Totals	M fbm	2,159	311	2,159	311	. . . . .	. . . . .
Piling:							
Softwood	M lin ft	43	32	43	32	. . . . .	. . . . .
Hardwood	M lin ft	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Total	M lin ft	43	32	43	32	. . . . .	. . . . .
Poles:							
Softwood	M pieces	713	8,238	713	8,238	. . . . .	. . . . .
Hardwood	M pieces	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Total	M pieces	713	8,238	713	8,238	. . . . .	. . . . .
Commercial post (round and split):							
Softwood	M pieces	4,110	2,307	4,110	2,307	. . . . .	. . . . .
Hardwood	M pieces	85	55	85	55	. . . . .	. . . . .
Total	M pieces	4,195	2,362	4,195	2,362	. . . . .	. . . . .
Other:[3]							
Softwood	M ft³	4,017	4,017	589	589	3,428	3,428
Hardwood	M ft³	7,900	7,900	2,877	2,877	5,023	5,023
Total	M ft³	11,917	11,917	3,466	3,466	8,451	8,451
Total industrial products:							
Softwood	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	381,470	. . . . .	100,379
Hardwood	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	135,406	. . . . .	17,823
Total	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	516,876	. . . . .	118,202
Noncommercial posts (round and split):							
Softwood	M pieces	316	202	316	202	. . . . .	. . . . .
Hardwood	M pieces	329	211	329	211	. . . . .	. . . . .
Total	M pieces	645	413	645	413	. . . . .	. . . . .
Fuelwood:							
Softwood	Std cd	505,846	37,938	2,393	179	503,453[4]	37,759[4]
Hardwood	Std cd	481,935	36,145	322,615	24,196	159,320[4]	11,949[4]
Total	Std cd	987,781	74,083	325,008	24,375	662,773[4]	49,708[4]
All products:							
Softwood	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	381,851	. . . . .	138,138
Hardwood	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	159,813	. . . . .	29,772
Total	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	541,664	. . . . .	167,910

[1]International ¼-inch rule.
[2]Rough wood basis (for example, chips converted to equivalent standard cords).
[3]Includes chemical wood, handle stock, miscellaneous dimension and other minor industrial products. Additionally, byproducts include material used for livestock bedding, mulch, etc.
[4]Includes plant byproducts used for industrial and domestic fuel.

Table 24.—*Output of roundwood products by source and by softwoods and hardwoods, Arkansas, 1977*

Products and species group	All sources	Growing-stock trees[1]			Rough and rotten trees[1]	Savable dead trees[1]	Other sources[2]
		Total	Saw-timber	Pole-timber			
	Thousand cubic feet						
Industrial products:							
Saw logs:							
Softwood	205,286	202,478	201,840	638	460	226	2,122
Hardwood	69,502	67,875	66,190	1,685	1,275	. . . .	352
Total	274,788	270,353	268,030	2,323	1,735	226	2,474
Veneer logs and bolts:							
Softwood	47,195	46,237	46,237	. . . . .	287	. . . .	671
Hardwood	1,414	1,390	1,390	. . . . .	18	. . . .	6
Total	48,609	47,627	47,627	. . . . .	305	. . . .	677
Pulpwood:							
Softwood	117,823	110,677	85,450	25,227	758	79	6,309
Hardwood	61,247	53,886	36,713	17,173	2,502	102	4,757
Total	179,070	164,563	122,163	42,400	3,260	181	11,066
Misc. industrial products:							
Cooperage:							
Softwood	. . . . .	. . . . .	. . . . .	. . . . .	. . . .	. . . .	. . . .
Hardwood	311	307	307	. . . . .	2	. . . .	2
Total	311	307	307	. . . . .	2	. . . .	2
Piling:							
Softwood	32	32	32	. . . . .	. . . .	. . . .	. . . .
Hardwood	. . . . .	. . . . .	. . . . .	. . . . .	. . . .	. . . .	. . . .
Total	32	32	32	. . . . .	. . . .	. . . .	. . . .
Poles:							
Softwood	8,238	8,177	7,232	945	. . . .	. . . .	61
Hardwood	. . . . .	. . . . .	. . . . .	. . . . .	. . . .	. . . .	. . . .
Total	8,238	8,177	7,232	945	. . . .	. . . .	61
Commercial posts (round and split):							
Softwood	2,307	2,101	91	2,010	8	. . .	198
Hardwood	55	49	14	35	2	. . . .	4
Total	2,362	2,150	105	2,045	10	. . . .	202
Other							
Softwood	589	502	249	253	10	2	75
Hardwood	2,877	2,608	2,173	435	108	50	111
Total	3,466	3,110	2,422	688	118	52	186
All misc. industrial products:							
Softwood	11,166	10,812	7,604	3,208	18	2	334
Hardwood	3,243	2,964	2,494	470	112	50	117
Total	14,409	13,776	10,098	3,678	130	52	451
All industrial products:							
Softwood	381,470	370,204	341,131	29,073	1,523	307	9,436
Hardwood	135,406	126,115	106,787	19,328	3,907	152	5,232
Total	516,876	496,319	447,918	48,401	5,430	459	14,668
Noncommercial posts (round and split):							
Softwood	202	184	8	176	1	. . . .	17
Hardwood	211	190	55	135	9	. . . .	12
Total	413	374	63	311	10	. . .	29
Fuelwood:							
Softwood	179	132	3	129	9	7	31
Hardwood	24,196	17,813	7,261	10,552	1,251	936	4,196
Total	24,375	17,945	7,264	10,681	1,260	943	4,227
All products:							
Softwood	381,851	370,520	341,142	29,378	1,533	314	9,484
Hardwood	159,813	144,118	114,103	30,015	5,167	1,088	9,440
Total	541,664	514,638	455,245	59,393	6,700	1,402	18,924

[1]On commercial forest land.

[2]Includes noncommercial forest land, nonforest land such as fence rows, trees less than 5.0 inches in diameter, and treetops and limbs.

Table 25.—*Timber removals from growing stock on commercial forest land by items and by softwoods and hardwoods, Arkansas, 1977.*

Item	All species	Softwood	Hardwood
		Thousand cubic feet	
Roundwood products:			
Saw logs	270,353	202,478	67,875
Veneer logs and bolts	47,627	46,237	1,390
Pulpwood	164,562	110,677	53,885
Cooperage logs and bolts	307	.....	307
Piling	32	32	.....
Poles	8,177	8,177	.....
Posts	2,529	2,286	243
Other	3,110	502	2,608
Fuelwood	17,940	132	17,808
All products	514,637	370,521	144,116
Logging residues	33,898	17,020	16,878
Other removals	66,179	16,907	49,272
Total removals	614,714	404,448	210,266

Table 26.—*Timber removals from live sawtimber on commercial forest land by items and by softwoods and hardwoods, Arkansas, 1977*

Item	All species	Softwood	Hardwood
		Thousand board feet	
Roundwood products:			
Saw logs	1,597,376	1,198,910	398,466
Veneer logs and bolts	304,416	296,239	8,177
Pulpwood	526,101	350,265	175,836
Cooperage logs and bolts	2,064	.....	2,064
Piling	189	189	.....
Poles	41,795	41,795	.....
Posts	670	396	274
Other	13,073	1,284	11,789
Fuelwood	35,502	14	35,488
All products	2,521,186	1,889,092	632,094
Logging residues	101,067	37,760	63,307
Other removals	164,963	64,758	100,205
Total removals	2,787,216	1,991,610	795,606

Table 27.—*Volume of plant residues by industrial source and type of residue and by softwoods and hardwoods, Arkansas, 1977.*

Species group and type	All industries	Lumber	Veneer and plywood	Other
		Thousand cubic feet		
Softwood:				
Coarse[1]	1,151	636	...	515
Fine[2]	3,685	2,670	...	1,015
Total	4,836	3,306	...	1,530
Hardwood:				
Coarse	2,554	2,285	119	150
Fine	5,330	5,028	5	297
Total	7,884	7,313	124	447
All species:				
Coarse	3,705	2,921	119	665
Fine	9,015	7,698	5	1,312
All types	12,720	10,619	124	1.977

[1]Unused material suitable for chipping, such as slabs, edgings, and veneer cores.

[2]Unused material not suitable for chipping, such as sawdust and shavings.

VAN HEES, WILLEM W. S.
1980. Arkansas forests: trends and prospects, U.S. Dep. Agric. For Serv. Resour. Bull. SO-77, 32 p. South. For. Exp. Stn, New Orleans, La.

Between 1969 and 1978, forest area in Arkansas declined 9 percent to 16.6 million acres. Softwood growing stock increased 13 percent to 8.1 billion cubic feet, while hardwood declined 2 percent to 9.1 billion cubic feet. Statewide, growth on growing stock exceeded removals. Softwood growth exceeded removals only in the Ozark and Southwest Regions.

Additional keywords: timber volume, forest acreage, timber cut, timber growth, forest industries.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980—771-081